Impressive multifunction integration

By Chuck Husick

Furuno's new NavNet 3D system leads the way with top imagery and features



product images and screen shots courtesy Furuno

Left, the NavNet 3D units use trackpads and a rotary knob called a RotoKey to select and contol display elements. Lower right, Furuno revamped both the NavNet software and its display hardware. The result is a tight integrated system.

Furuno's new NavNet 3D system sets the new standard for integrated marine electronic navigation systems. The NavNet 3D chartplotter and radar provide a level of capability and performance that is superior to any previous Furuno system and is a challenge to the systems offered by other manufacturers. Available with integrated 8.4-inch or 12.1-inch diagonal color LCD screens or as a black box system that can support up to 10 multifunction displays, NavNet 3D will fulfill the electronic navigation needs of virtually any size vessel, providing information from system sensors including WAAS, GPS, AIS, radar, sonar, Sirius Marine Weather, Weatherfax, weather station, sailing instruments, engine instruments and IP video cameras. The system also interfaces with the autopilot, a new GPS compass system and the audio program from the Sirius Satellite receiver.

The display screen and the controls for the most often used functions, the chartplotter and radar, are the heart of any multifunction electronic navigation system. The NavNet 3D system is available in three formats: integrated display/processor units with 8.4-inch diagonal, VGA (640 x 480 pixel) color LCD screen; a 12.1-inch SVGA (800 x 600 pixel) display; and a black box version that is compatible with virtually any multisync display. The black box system will support up to 1280 x 1024 pixel, SXGA resolution. The LCD display units can be flush or trunnion mounted and provide two SD cards on their front panels.

SD card slots are also provided on the Ethernet-connected control module for the black box system, eliminating the need to access to the remote central processor unit when switching cards.

A chartplotter can be no better than its charts. The NavNet 3D system is delivered with a complete set of MapMedia's NOAA raster, vector and bathymetric charts for the U.S. (including Alaska and Hawaii) stored in its internal memory. Charts can be updated at any time by downloading the latest versions from the Furuno website (www.NavNet.com) onto an SD card for transfer to the plotter's internal memory. Satellite image files appropriate for the planned navigation area are also obtained from the Furuno Web site. Since the satellite photo files for total U.S. coverage far exceed the system's memory capacity, the picture files for a defined planned navigation area, for example the coastline from northern New Jersey to Cape Cod, are downloaded and transferred to the internal memory. MapMedia, S57-based charts for foreign waters not covered by NOAA, are downloaded in similar fashion, however there will likely be a charge for the data since virtually all countries except the U.S. copyright and charge for their charts.

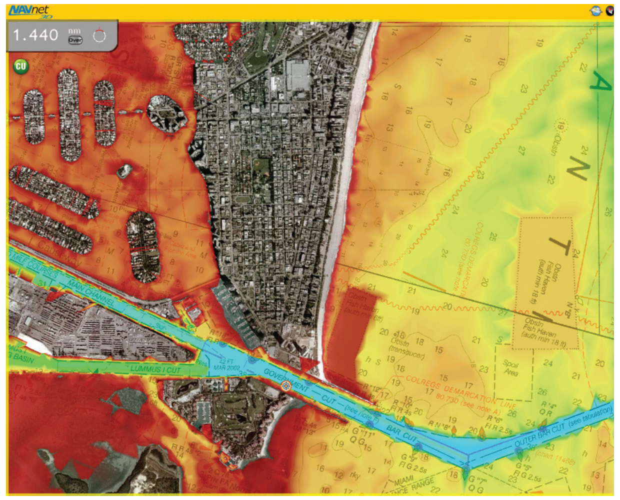
The chart images are created from the NOAA and other official cartography using GIS (geographic information system) technology. Information in GIS form can be displayed at virtually any desired scale, with the amount of detail information continuously matched to the resolution of the display system. In the NavNet 3D system the maximum range setting will display the entire NOAA hemisphere chart. When zoomed all the way in the chart will be seen at a scale of 1/8th nm.

Seamless zooming



Furuno's TimeZero technology, a combination of software, a high-speed processor and a powerful graphics engine makes the image flow smoothly, without interruption and without the need for screen re-draw. The scrolling pad makes it easy to move from the vessel's present position to anywhere in charted U.S. and Bahamian waters and zoom in to examine the smallest detail. Regardless of the distance to the location you have chosen to examine, even thousands of miles from your actual location, a short stroke of the ship/3D key in the center of the scrolling pad will instantly restore the normal vessel-centered chart view. A long stroke of the combination ship/3D key in the center of the scrolling pad toggles the display between 3D to 2D. In 3D display mode the combination of the range key and scrolling pad provides complete display perspective freedom similar to the image management found in Google Earth.

In addition to the display of nautical charts, tide and current information, the NavNet 3D system's Satellite Photo Fusion technology integrates satellite images of terrain and shallow water areas with both raster and vector charts. The satellite photos are precisely geo-referenced to the chart in use. The photo image is presented so that all land areas are completely opaque to provide maximum detail (photo image resolution is



NavNet 3D combines sat photos with electronic charts and colorized depth shading.

50 cm/pixel). Areas where the images contain useful shallow water bottom details are made progressively transparent, presenting both photo and navigation chart information. Areas where the photo contains no useful navigation information are made entirely transparent, eliminating possibly confusing images of objects that were on the water when the satellite image was created and assuring that all charted navigation information is clearly in view.

The system's split screen options, single, dual, three or four windows, allow simultaneous side-by-side viewing of raster and vector charts, with photo images fused with both views. The Ethernet-connected Furuno FA 30/50 synthesized AIS receiver can present information from up to 100 AIS-reporting vessels on the chart screen and when desired on the radar image. Vessels that present a possibility of a close approach or collision can be tracked with automatic alerting for those whose tracks portend a close approach or possibility of collision. The use of a frequency synthesizer in the AIS receiver assures that the unit will be able to operate on other than the two standard AIS-reporting channels (87B and 88B) if required by area specific regulations.

Radar that looks twice

The most impressive feature of the new NavNet 3D UHD radar equipment is its unique ability to perform like two separate radar sets, each scanning at whatever ranges are appropriate for the navigation situation. Unlike previous dual range radar systems whose performance was limited by the need to use the pulse length required for the longest selected range, the UHD manages the transmitted pulse length for each range independently, eliminating any performance compromise. The radar's look twice simultaneous dual range capability is achieved by double pulsing the magnetron, matching the duration of each alternate transmitted pulse to the selected range.

The full range of operator controls, range, gain, sea state, interference rejection, rain suppression, echo stretch, target trail, variable range marker, electronic bearing line, etc., are available individually for both ranges when the system is operating in dual range mode. Each radar display can be operated with an independent vessel offset setting. The radar image can be displayed in a single, split, three or four screen format and can be overlaid on the chart/satellite photo image. The radar's performance is additionally aided by automatically matching the antenna rotation or sweep speed to the longest range in use (required to accommodate the longer pulse lengths needed for longer ranges), 48 rpm for short ranges, 36 rpm for middle distances and the standard 24 rpm for long ranges.

The new UHD radars are available with RF power ratings from 2 to 25 kw. Two radome antenna models are available, 2 kw, 18-inch diameter, 24 nm and 4 kw, 24-inch diameter, 36 nm maximum range. The radomes are a new wind tunnel proven, low aerodynamic drag design. Open array models include a 4 kw/3.5 foot, 48 nm, 6 kw/4 foot, 64 nm, 12 kw, 72 nm or 25 kw with 4- or 6-foot antennas, maximum range 96 nm.

The digital signal processing (DSP) technology employed in these new units (and used to great advantage in Furuno sonar/fish finders) significantly improves the radar's ability to detect and accurately visualize small, often difficult to detect targets. Small boats and navigation aids with very limited radar cross sections are clearly imaged. The on screen radar image clearly shows the effectiveness of the new signal processing circuits in suppressing antenna sidelobe response and in automatically managing main bang response.

Automatic radar plotting aid (ARPA), previously a 10-target tracking option on Furuno radar sets in this category is now standard and is able to simultaneously track up to 30 targets. All tracked targets within the selected range will appear on both radar screens when operating as a dual range radar. All of the AIS targets (up to 100) are available on both screens.

The new UHD radars are remarkably easy to install since the entire radar system, including the receiver and all signal processing electronics are housed in the antenna unit and connect to the NavNet 3D system using an Ethernet cable and a pair of 48-volt DC power wires. Anyone who has dealt with the multi-conductor cable of 20-plus single wires and a miniature coax will applaud Furuno's use of a single, easy-to-install Ethernet cable. Each radar (or radars) and the majority of the other sensors used in the system are assigned unique IP addresses, greatly simplifying setup, the addition of sensors and problem analysis if the need arises. Two NMEA 2000 connectors provided on the antenna housing make it possible to connect devices such as GPS receivers, masthead wind instruments or the Furuno Weather Station to the system network without the need to run additional cables.

The series of manual timing/tuning adjustments formerly required on the installation of a radar is now accomplished automatically. The only manual adjustment required at initial startup, matching the radar's lubber line to the vessel's longitudinal axis, is accomplished at the radar display.

The black box version of the NavNet 3D system can support up to 10 multifunction display screens. The black box system's central processor supports an extended mode in which the data output is shared across two screens, providing a range of display choices from two large individual screens to as many as eight screen windows. Control of each display window (in both the single unit and black box versions of the system) is accomplished by moving the cursor into the boundary of the screen to be controlled. No additional control actions are required. Highlighting the boundary of the active window signifies that the controls are assigned to that window.

Painless system integration

The majority of ancillary sensors for the NavNet 3D system, including the Sir-



Another example of how the system can render sat photos and raster charts.



This Furuno diagram shows the various sensor and display elements that can be plugged into the system using Ethernet, NMEA 0183 and NMEA 2000.

ius Satellite weather receiver, Furuno Weatherfax receiver, Network Fish Finders, the FA/30/50 AIS receiver, up to 4 IP video cameras and a PC connect to the 3D system via Ethernet, greatly simplifying installation and control of the system. Audio signals from the Sirius receiver are accommodated by the NavNet 3D system, including the provision of a front panel audio volume control (a feature frequently asked for in NavNet vx2 installations). Connections to other sensors including the Furuno Weather Station, the new GPS compass, Furuno's new sailing instruments and engine/vessel data are accomplished using NMEA 2000 or NMEA 0183. NMEA 2000 is used for communication between the Network Fish Finder and the sonar transducer to provide the transducer's model number, frequency and date of manufacture information for use in optimizing system performance by compensating for known ageing effects in the transducer.

The new NavNet 3D system does more and is significantly easier to manage than previous Furuno chartplotter/radar multifunction systems whose control logic remained rather opaque even after years of use. We believe that the system's user-friendly interface is in part a result of Furuno's investment in MaxSea and their participation in the design of the system software.

Examples of the new way of doing things are especially visible in the use of point and click control functions and the elimination of the need to progress through menu layers to select or change functions or displays. Almost everything is only one click or a slight rotation of the RotoKey away. The wisdom of Furuno's decision to use Ethernet as the communication bus beginning with the original NavNet system in 2001 is reinforced in NavNet 3D. The plug and play nature of the Ethernet bus system is illustrated by the ease with which an IP video camera can be plugged into a hub and the image it captures is displayed on the screen and controlled from the system's scrolling pad.

Having seen all the new features and capabilities of this new system we can't help but wonder what's next. Perhaps the coming year will see a new chart image option, the ability to overlay a raster chart on a vector chart, providing the navigator with the best of both worlds: the familiar and easy to use conventional chart image and with a click, access to the mass of data that is instantly accessible from the ENC database. In the area of sensors, an integrated video surveillance camera using both night vision TV and an infrared camera would likely be welcomed by many navigators, as would an effective look-ahead, depth-scanning sonar. ■